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# **Basin 18 Supplemental Sampling and Analysis Plan**

## **Source Control Evaluation**

### **Burgard Industrial Park**

### **Portland, Oregon**

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**DATE:** October 16, 2015

This memorandum presents the Basin 18 supplemental sampling and analysis plan (Basin 18 SSAP) for the Burgard Industrial Park (BIP) Source Control Evaluation (SCE) project in Portland, Oregon (Figure 1, Figure 2).

This memorandum presents the overall objective of the Basin 18 supplemental SCE sampling and analyses and the methods to be used to collect and analyze the storm water, storm water solids, and soil samples. Attachments to this memorandum will be prepared to describe the specific media and locations for the sampling and analysis to be performed at the individual properties within, and adjacent to, Basin 18.

## **Basin 18 Description**

Basin 18 consists of an approximately 85 acre area on the east side of the BIP. Figure 3 shows the approximate boundaries of Basin 18 and a summary of the storm water drainage features. The Basin 18 boundaries are based on site topography, observations made during rainfall events, and the drainage basins shown in historical Storm Water Pollution Prevention and Control (SWPC) plans prepared by the site operators within Basin 18.

Only about 25 acres of the Basin 18 area is within the BIP as defined in the 2000 Voluntary Agreement between Schnitzer and the Oregon DEQ. Basin 18 areas outside the BIP include:

- Northwest Pipe property (about 26 acres);
- Dunkin & Bush property (<1 acre);
- N. Sever Road (<1 acre);
- PGE Substation property (about 6 acres);
- Lampros property (about 25 acres); and
- City of Portland Burgard Road (about 2 acres).

Thus, about 70 percent of the area drained by Outfall 18 is not on the BIP site subject to the Voluntary Agreement between Schnitzer and DEQ for the source control evaluation work.

Activities occurring on the BIP portion of Basin 18 include vehicle traffic on Burgard Way. Most of the southern portion of the BIP portion of Basin 18 is used by Northwest Pipe to store pipe and material inventory. Four structures used for light manufacturing are located in the central portion of Basin 18 within the BIP.

Burgard Way is paved as is the area around the light manufacturing buildings in the central area. The southern area used by Northwest Pipe for storage is not paved, but is served by the stormwater collection and conveyance system.

## Project History and SSAP Objective

Extensive sampling and analysis of the Basin 18 storm water discharging from the BIP portion of Basin 18 has been performed over the past 2 ½ years. The Basin 18 sampling and analysis performed to date was in general accordance<sup>1</sup> with the October 8, 2011 *Source Control Evaluation, Basin 18 Storm Water and Storm Water Solids Sampling and Analysis Plan, Burgard Industrial Park*. The Oregon Department of Environmental Quality (DEQ) provided conditional approval of the sampling and analysis plan in a January 12, 2012 letter.

The results of the Basin 18 sampling and analysis performed to date were presented in the following Bridgewater Group memoranda:

- *Basin 18 Storm Water and Storm Water Solids, Sampling and Analysis Data, Source Control Evaluation, Burgard Industrial Park*, March 1, 2013;
- *Basin 18 Storm Water Sampling and Analysis Data, February 22, 2013 Sampling Event, Source Control Evaluation, Burgard Industrial Park*, April 9, 2013;
- *Basin 18 Storm Water Sampling and Analysis Data, November 18, 2013 Sampling Event, Source Control Evaluation, Burgard Industrial Park*, January 26, 2014;
- *Basin 18 Storm Water Sampling and Analysis Data, January 7, 2014 Sampling Event, Source Control Evaluation, Burgard Industrial Park*, April 2, 2014;

The SCE sampling and analysis to date noted several chemicals of interest (COIs) in storm water sample discharging from Basin 18 at concentrations greater than screening level values (SLVs)<sup>2</sup>.

During meetings in May 2015 and August 2015, DEQ requested that additional source control sampling and analysis be performed. In particular, DEQ requested that additional sampling be performed within Basin 18 to identify the source(s) of COIs noted in the Basin 18 discharge storm water samples. The objective of this Basin 18 SSAP, including the property-specific sampling plans attached to this document, is to identify source(s) within Basin 18 that result in migration of COIs at concentrations that may pose an unacceptable risk to the Willamette River (i.e., Portland Harbor). This Basin 18 SSAP also describes limited, interim source control measures to be implemented as part of the supplemental SCE sampling program.

The results of the Basin 18 storm water sampling will be used to determine if additional Basin 18 source control measures are potentially necessary, what those measures may consist of, and whether additional data gathering is necessary to further assess potential contaminant sources in Basin 18. As previously discussed with DEQ, SSI does not own any portions of Basin 18, other than a one-quarter interest in the small area along Burgard Way on the northern edge of

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<sup>1</sup> A March 1, 2013 memorandum *Basin 18 Storm Water and Storm Water Solids, Sampling and Analysis Data, Source Control Evaluation, Burgard Industrial Park* describes where the actual sampling differed from that described in the October 8, 2015 sampling plan.

<sup>2</sup> SLVs based on the July 16, 2007, Table 3-1 of the DEQ Portland Harbor Joint Source Control Strategy and the Preliminary Remediation Goals (PRGs) in the Section 2.2 tables in the July 2015 Draft Portland Harbor Feasibility Study.

Basin 18 and the portion of the SSI/Northwest Pipe entrance road on the south edge of Basin 18, and cannot control activities and features in Basin 18.

## Storm Water and Storm Water Solids Sampling Methodologies

### *Storm Water Sampling Conditions*

Storm water samples will be collected either directly into laboratory-supplied containers or in clean containers used to transfer the water to the laboratory containers.

Each storm water sampling event will be preceded by at least 24 hours with no more than 0.1 inches of precipitation. All of the storm water samples will be collected within the first three hours of discharge. Rainfall gauge data from the Shipyard rain gauge (City of Portland Station 82) and the weather station present on the SSI property will be used to document the rainfall event conditions for each sampling event.

### *Storm Water Solids Sampling*

Storm water solids (catch basin sediments, conveyance pipe cleanout, erodible surface soil) samples will be collected using clean hand tools. The collected solids will be placed in laboratory-supplied containers and placed in a chilled cooler for transport to the laboratory under chain-of-custody procedures.

## Chemical Analysis of Water and Solids Samples

As requested by DEQ, Basin 18 water and solids samples will be analyzed for the following:

- Polycyclic aromatic hydrocarbons (PAHs);
- PCB aroclors, homologs, and congeners;
- Dioxins/furans;
- Butyltins;
- Aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, silver, and zinc;
- Total Petroleum Hydrocarbons (gasoline, diesel, and heavy oil);
- Total suspended solids (TSS) (water only); and
- Total organic carbon (TOC).

Phthalates and chlorinated pesticides were included in the original Basin 18 COI list. However, these chemicals were not detected in the Basin 18 sampling and analysis performed to date and have been removed as a Basin 18 COI.

Table 1 shows the specific analytical methods, laboratory containers, holding times, and preservatives to be used for each parameter for the water analysis. Table 2 shows the analytical laboratory detection limits for each chemical for the water analysis and compares the limits to the SLVs. As noted on Table 2, the laboratory detection limits are approximately equal to or less than the JSCS SLVs except for dioxins, PCB aroclors, and a few metals. The detection limits are greater than the Portland Harbor PRGs SLVs for PAHs, dioxin, PCB aroclors, and arsenic.

Table 3 shows the specific analytical methods, laboratory containers, holding times, and preservatives to be used for each parameter for the solids analysis. Table 4 shows the analytical laboratory detection limits for each chemical for the solids analysis and compares the

limits to the SLVs. As noted on Table 4, the solids laboratory detection limits are approximately equal to or less than the solids JSCS SLVs except for total PCB aroclors. The solids detection limits are greater than the Portland Harbor PRGs for 1,2,3,4,7,8-HexaCDF.

## Sampling and Analysis Results Reporting

A data memorandum will be submitted to DEQ within 30 days of receipt of the final analytical laboratory report for each sampling event. The data reports will include tables presenting results of the laboratory analysis and a comparison with SLVs. Rainfall event data will also be presented relevant to each storm water sampling event.

### Attachments:

- Table 1 Water Analytical Laboratory Methods, Sample Containers, Holding times, and Preservation
- Table 2 Water Analytical Laboratory Detection Limits
- Table 3 Solids Analytical Laboratory Methods, Sample Containers, Holding times, and Preservation
- Table 4 Solids Analytical Laboratory Detection Limits
- Figure 1 Site Location Map
- Figure 2 Site Plan
- Figure 3 Basin 18 Site Plan

## Tables

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**Table 1**  
**Water Analytical Laboratory Methods, Sample Containers, Holding Times, and Preservation**

| Analytical Parameter   | Analytical Method | Container          | Holding Time                      | Preservation                                |
|--|-------------------|--------------------|-----------------------------------|---|
| Aluminum, Antimony, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Zinc | EPA 6020          | 500-ml HDPE bottle | 6 months<br>Hg 28-days            | HNO <sub>3</sub> pH<2, 4 ±2°C               |
| Tributyltin  | KRONE             | 1-liter amber      | 7 day extract<br>40 days analysis | 4 ±2°C                                      |
| PCB Aroclors, Congeners, and Homologs  | EPA 1668A         | 1-liter amber      | 1 year                            | 4 ±2°C                                      |
| Dioxins/furans   | EPA 8290          | 1-liter amber      | 1 year                            | 4 ±2°C                                      |
| PAHs   | EPA 8270SIM       | 1-liter amber      | 7 day extract<br>40 days analysis | 4 ±2°C                                      |
| Total Organic Carbon   | SM 5310 Mod       | 250-ml HDPE bottle | 28 days                           | H <sub>2</sub> SO <sub>4</sub> pH<2, 4 ±2°C |
| Total Petroleum Hydrocarbons   | NW-TPH Methods    | 1-liter amber      | 7 day extract<br>40 days analysis | 4 ±2°C                                      |
| Total Suspended Solids   | SM 2540D          | 250-ml HDPE bottle | 7 days                            | 4 ±2°C                                      |

**Table 2**  
**Water Analytical Laboratory Detection Limits**

| Chemical                       | Portland Harbor SLV<br>JSCS <sup>1</sup> | PRG <sup>2</sup> | Analytical Laboratory<br>Detection Limit |
|--------------------------------|--|------------------|--|
| PAHs (ug/l)                    |  |                  |  |
| Acenaphthene                   | 0.2                                      |                  | 0.010                                    |
| Acenaphthylene                 | 0.2                                      |                  | 0.010                                    |
| Anthracene                     |  |                  | 0.010                                    |
| Benzo(a)anthracene             | 0.018                                    | 0.0012           | 0.010                                    |
| Benzo(a)pyrene                 | 0.018                                    | 0.00012          | 0.015                                    |
| Benzo(b)fluoranthene           | 0.018                                    | 0.0012           | 0.015                                    |
| Benzo(k)fluoranthene           | 0.018                                    | 0.0013           | 0.015                                    |
| Benzo(b+k)fluoranthene         | 0.018                                    | 0.0013           | 0.015                                    |
| Benzo(g,h,i)perylene           | 0.2                                      |                  | 0.010                                    |
| Chrysene                       | 0.018                                    | 0.0013           | 0.010                                    |
| Dibenz(a,h)anthracene          | 0.018                                    | 0.00012          | 0.010                                    |
| Fluoranthene                   | 0.2                                      |                  | 0.010                                    |
| Fluorene                       | 0.2                                      |                  | 0.010                                    |
| Indeno(1,2,3-cd)pyrene         | 0.018                                    | 0.0013           | 0.010                                    |
| Naphthalene                    | 0.2                                      | 12               | 0.020                                    |
| Phenanthrene                   | 0.2                                      |                  | 0.010                                    |
| Pyrene                         | 0.2                                      |                  | 0.010                                    |
| Total Detected CPAHs (BaP TEF) |  | 0.00012          |  |
| PCBs (ug/l)                    |  |                  |  |
| Aroclor 1016                   | 0.96                                     |                  | 0.02                                     |
| Aroclor 1221                   | 0.034                                    |                  | 0.02                                     |
| Aroclor 1232                   | 0.034                                    |                  | 0.02                                     |
| Aroclor 1242                   | 0.034                                    |                  | 0.02                                     |
| Aroclor 1248                   | 0.034                                    |                  | 0.02                                     |
| Aroclor 1254                   | 0.034                                    |                  | 0.02                                     |
| Aroclor 1260                   | 0.034                                    |                  | 0.02                                     |
| Aroclor 1262                   |  |                  | 0.02                                     |
| Aroclor 1268                   |  |                  | 0.02                                     |
| Total Aroclors                 | 0.000064                                 | 0.0000064        | 0.02                                     |
| PCB Congeners (pg/l)           |  |                  |  |
| PCB001                         |  |                  | 0.5                                      |
| PCB002                         |  |                  | 0.5                                      |
| PCB003                         |  |                  | 0.5                                      |
| PCB004 & 010                   |  |                  | 0.5                                      |
| PCB005 & 008                   |  |                  | 0.5                                      |
| PCB006                         |  |                  | 0.5                                      |
| PCB007 & 009                   |  |                  | 0.5                                      |
| PCB011                         |  |                  | 0.5                                      |
| PCB012 & 013                   |  |                  | 0.5                                      |
| PCB014                         |  |                  | 0.5                                      |
| PCB015                         |  |                  | 0.5                                      |
| PCB016 & 032                   |  |                  | 0.5                                      |
| PCB017                         |  |                  | 0.5                                      |
| PCB018                         |  |                  | 0.5                                      |
| PCB019                         |  |                  | 0.5                                      |
| PCB020 & 021 & 033             |  |                  | 0.5                                      |
| PCB022                         |  |                  | 0.5                                      |
| PCB023                         |  |                  | 0.5                                      |
| PCB024 & 027                   |  |                  | 0.5                                      |
| PCB025                         |  |                  | 0.5                                      |
| PCB026                         |  |                  | 0.5                                      |
| PCB028                         |  |                  | 0.5                                      |
| PCB029                         |  |                  | 0.5                                      |
| PCB030                         |  |                  | 0.5                                      |
| PCB031                         |  |                  | 0.5                                      |
| PCB034                         |  |                  | 0.5                                      |
| PCB035                         |  |                  | 0.5                                      |
| PCB036                         |  |                  | 0.5                                      |
| PCB037                         |  |                  | 0.5                                      |
| PCB038                         |  |                  | 0.5                                      |
| PCB039                         |  |                  | 0.5                                      |
| PCB040                         |  |                  | 0.5                                      |
| PCB041 & 064 & 071 & 072       |  |                  | 0.5                                      |
| PCB042 & 059                   |  |                  | 0.5                                      |
| PCB043 & 049                   |  |                  | 0.5                                      |
| PCB044                         |  |                  | 0.5                                      |
| PCB045                         |  |                  | 0.5                                      |
| PCB046                         |  |                  | 0.5                                      |
| PCB047                         |  |                  | 0.5                                      |
| PCB048 & 075                   |  |                  | 0.5                                      |

**Table 2**  
**Water Analytical Laboratory Detection Limits**

| Chemical           | Portland Harbor SLV<br>JSCS <sup>1</sup> | PRG <sup>2</sup> | Analytical Laboratory<br>Detection Limit |
|--------------------|--|------------------|--|
| PCB050             |  |                  | 0.5                                      |
| PCB051             |  |                  | 0.5                                      |
| PCB052 & 069       |  |                  | 0.5                                      |
| PCB053             |  |                  | 0.5                                      |
| PCB054             |  |                  | 0.5                                      |
| PCB055             |  |                  | 0.5                                      |
| PCB056 & 060       |  |                  | 0.5                                      |
| PCB057             |  |                  | 0.5                                      |
| PCB058             |  |                  | 0.5                                      |
| PCB061 & 070       |  |                  | 0.5                                      |
| PCB062             |  |                  | 0.5                                      |
| PCB063             |  |                  | 0.5                                      |
| PCB065             |  |                  | 0.5                                      |
| PCB066 & 076       |  |                  | 0.5                                      |
| PCB067             |  |                  | 0.5                                      |
| PCB068             |  |                  | 0.5                                      |
| PCB073             |  |                  | 0.5                                      |
| PCB074             |  |                  | 0.5                                      |
| PCB077             |  |                  | 0.5                                      |
| PCB078             |  |                  | 0.5                                      |
| PCB079             |  |                  | 0.5                                      |
| PCB080             |  |                  | 0.5                                      |
| PCB081             |  |                  | 0.5                                      |
| PCB082             |  |                  | 0.5                                      |
| PCB083             |  |                  | 0.5                                      |
| PCB084 & 092       |  |                  | 0.5                                      |
| PCB085 & 116       |  |                  | 0.5                                      |
| PCB086             |  |                  | 0.5                                      |
| PCB087 & 117 & 125 |  |                  | 0.5                                      |
| PCB088 & 091       |  |                  | 0.5                                      |
| PCB089             |  |                  | 0.5                                      |
| PCB090 & 101       |  |                  | 0.5                                      |
| PCB093             |  |                  | 0.5                                      |
| PCB094             |  |                  | 0.5                                      |
| PCB095 & 098 & 102 |  |                  | 0.5                                      |
| PCB096             |  |                  | 0.5                                      |
| PCB097             |  |                  | 0.5                                      |
| PCB099             |  |                  | 0.5                                      |
| PCB100             |  |                  | 0.5                                      |
| PCB103             |  |                  | 0.5                                      |
| PCB104             |  |                  | 0.5                                      |
| PCB105             |  |                  | 0.5                                      |
| PCB106 & 118       |  |                  | 0.5                                      |
| PCB107 & 109       |  |                  | 0.5                                      |
| PCB108 & 112       |  |                  | 0.5                                      |
| PCB110             |  |                  | 0.5                                      |
| PCB111 & 115       |  |                  | 0.5                                      |
| PCB113             |  |                  | 0.5                                      |
| PCB114             |  |                  | 0.5                                      |
| PCB119             |  |                  | 0.5                                      |
| PCB120             |  |                  | 0.5                                      |
| PCB121             |  |                  | 0.5                                      |
| PCB122             |  |                  | 0.5                                      |
| PCB123             |  |                  | 0.5                                      |
| PCB124             |  |                  | 0.5                                      |
| PCB126             |  |                  | 0.5                                      |
| PCB127             |  |                  | 0.5                                      |
| PCB128 & 162       |  |                  | 0.5                                      |
| PCB129             |  |                  | 0.5                                      |
| PCB130             |  |                  | 0.5                                      |
| PCB131             |  |                  | 0.5                                      |
| PCB132 & 161       |  |                  | 0.5                                      |
| PCB133 & 142       |  |                  | 0.5                                      |
| PCB134 & 143       |  |                  | 0.5                                      |
| PCB135             |  |                  | 0.5                                      |
| PCB136             |  |                  | 0.5                                      |
| PCB137             |  |                  | 0.5                                      |
| PCB138 & 163 & 164 |  |                  | 0.5                                      |
| PCB139 & 149       |  |                  | 0.5                                      |
| PCB140             |  |                  | 0.5                                      |
| PCB141             |  |                  | 0.5                                      |
| PCB144             |  |                  | 0.5                                      |
| PCB145             |  |                  | 0.5                                      |

**Table 2**  
**Water Analytical Laboratory Detection Limits**

| Chemical                 | Portland Harbor SLV<br>JSCS <sup>1</sup> | PRG <sup>2</sup> | Analytical Laboratory<br>Detection Limit |
|--------------------------|--|------------------|--|
| PCB146 & 165             |  |                  | 0.5                                      |
| PCB147                   |  |                  | 0.5                                      |
| PCB148                   |  |                  | 0.5                                      |
| PCB150                   |  |                  | 0.5                                      |
| PCB151                   |  |                  | 0.5                                      |
| PCB152                   |  |                  | 0.5                                      |
| PCB153                   |  |                  | 0.5                                      |
| PCB154                   |  |                  | 0.5                                      |
| PCB155                   |  |                  | 0.5                                      |
| PCB156                   |  |                  | 0.5                                      |
| PCB157                   |  |                  | 0.5                                      |
| PCB158 & 160             |  |                  | 0.5                                      |
| PCB159                   |  |                  | 0.5                                      |
| PCB166                   |  |                  | 0.5                                      |
| PCB167                   |  |                  | 0.5                                      |
| PCB168                   |  |                  | 0.5                                      |
| PCB169                   |  |                  | 0.5                                      |
| PCB170                   |  |                  | 0.5                                      |
| PCB171                   |  |                  | 0.5                                      |
| PCB172                   |  |                  | 0.5                                      |
| PCB173                   |  |                  | 0.5                                      |
| PCB174                   |  |                  | 0.5                                      |
| PCB175                   |  |                  | 0.5                                      |
| PCB176                   |  |                  | 0.5                                      |
| PCB177                   |  |                  | 0.5                                      |
| PCB178                   |  |                  | 0.5                                      |
| PCB179                   |  |                  | 0.5                                      |
| PCB180                   |  |                  | 0.5                                      |
| PCB181                   |  |                  | 0.5                                      |
| PCB182 & 187             |  |                  | 0.5                                      |
| PCB183                   |  |                  | 0.5                                      |
| PCB184                   |  |                  | 0.5                                      |
| PCB185                   |  |                  | 0.5                                      |
| PCB186                   |  |                  | 0.5                                      |
| PCB188                   |  |                  | 0.5                                      |
| PCB189                   |  |                  | 0.5                                      |
| PCB190                   |  |                  | 0.5                                      |
| PCB191                   |  |                  | 0.5                                      |
| PCB192                   |  |                  | 0.5                                      |
| PCB193                   |  |                  | 0.5                                      |
| PCB194                   |  |                  | 0.5                                      |
| PCB195                   |  |                  | 0.5                                      |
| PCB196 & 203             |  |                  | 0.5                                      |
| PCB197                   |  |                  | 0.5                                      |
| PCB198                   |  |                  | 0.5                                      |
| PCB199                   |  |                  | 0.5                                      |
| PCB200                   |  |                  | 0.5                                      |
| PCB201                   |  |                  | 0.5                                      |
| PCB202                   |  |                  | 0.5                                      |
| PCB204                   |  |                  | 0.5                                      |
| PCB205                   |  |                  | 0.5                                      |
| PCB206                   |  |                  | 0.5                                      |
| PCB207                   |  |                  | 0.5                                      |
| PCB208                   |  |                  | 0.5                                      |
| PCB209                   |  |                  | 0.5                                      |
| Total PCB congeners      | 64                                       | 6.4              | 1 to 30                                  |
| PCB Homologs (pg/l)      |  |                  |  |
| Monochlorobiphenyl       |  |                  | 0.5                                      |
| Dichlorobiphenyl         |  |                  | 0.5                                      |
| Trichlorobiphenyl        |  |                  | 0.5                                      |
| Tetrachlorobiphenyl      |  |                  | 0.5                                      |
| Pentachlorobiphenyl      |  |                  | 0.5                                      |
| Hexachlorobiphenyl       |  |                  | 0.5                                      |
| Heptachlorobiphenyl      |  |                  | 0.5                                      |
| Octachlorobiphenyl       |  |                  | 0.5                                      |
| Nonachlorobiphenyl       |  |                  | 0.5                                      |
| Total PCBs (Method 1668) | 64                                       | 6.4              | 0.5                                      |
| Dioxins (pg/l)           |  |                  |  |

**Table 2**  
**Water Analytical Laboratory Detection Limits**

| Chemical                       | Portland Harbor SLV<br>JSCS <sup>1</sup> | PRG <sup>2</sup> | Analytical Laboratory<br>Detection Limit |
|--------------------------------|--|------------------|--|
| 1,2,3,4,6,7,8-HeptaCDF         |  |                  | 1.0                                      |
| 1,2,3,4,6,7,8-HeptaCDD         |  |                  | 1.0                                      |
| 1,2,3,4,7,8,9-HeptaCDF         |  |                  | 1.0                                      |
| 1,2,3,4,7,8-HexaCDF            |  |                  | 1.0                                      |
| 1,2,3,4,7,8-HexaCDD            |  |                  | 1.0                                      |
| 1,2,3,6,7,8-HexaCDF            |  |                  | 1.0                                      |
| 1,2,3,6,7,8-HexaCDD            |  |                  | 1.0                                      |
| 1,2,3,7,8,9-HexaCDF            |  |                  | 1.0                                      |
| 1,2,3,7,8,9-HexaCDD            |  |                  | 1.0                                      |
| 1,2,3,7,8-PentaCDF             |  |                  | 1.0                                      |
| 1,2,3,7,8-PentaCDD             |  |                  | 1.0                                      |
| 2,3,4,6,7,8-HexaCDF            |  |                  | 1.0                                      |
| 2,3,4,7,8-PentaCDF             |  |                  | 1.0                                      |
| 2,3,7,8-TetraCDF               |  |                  | 1.0                                      |
| 2,3,7,8-TetraCDD               | 0.0051                                   | 0.00051          | 1.0                                      |
| HeptaCDF homologs              |  |                  |  |
| HeptaCDD homologs              |  |                  |  |
| HexaCDF homologs               |  |                  |  |
| HexaCDD homologs               |  |                  |  |
| OCDF                           |  |                  | 1.5                                      |
| OCDD                           |  |                  | 1.5                                      |
| PentaCDF homologs              |  |                  |  |
| PentaCDD homologs              |  |                  |  |
| TetraCDF homologs              |  |                  |  |
| TetraCDD homologs              |  |                  |  |
| Total 2,3,7,8-TetraCDD TEQ Eq  | 0.0051                                   | 0.00051          | 1.3                                      |
| Butyltins (ug/l)               |  |                  |  |
| Butyltin ion                   |  |                  | 0.20                                     |
| Dibutyltin ion                 |  |                  | 0.30                                     |
| Tributyltin ion                | 0.072                                    | 0.063            | 0.076                                    |
| Tetrabutyltin                  |  |                  |  |
| Metals (ug/l)                  |  |                  |  |
| Aluminum                       |  |                  | 4.0                                      |
| Antimony                       | 6  |                  | 0.50                                     |
| Arsenic                        | 0.045                                    | 0.018            | 0.50                                     |
| Cadmium                        | 0.094                                    |                  | 0.50                                     |
| Chromium                       | 100                                      |                  | 0.50                                     |
| Copper                         | 2.7                                      | 100              | 1.0                                      |
| Lead                           | 0.54                                     | 3                | 0.50                                     |
| Manganese                      | 50                                       |                  | 0.50                                     |
| Mercury                        | 0.77                                     | 50               | 0.040                                    |
| Nickel                         | 16                                       |                  | 0.50                                     |
| Selenium                       | 5  |                  | 0.50                                     |
| Silver                         | 0.12                                     |                  | 0.50                                     |
| Zinc                           | 36                                       | 36.5             | 2.0                                      |
| Pertroleum Hydrocarbons (mg/l) |  |                  |  |
| Gasoline                       | 1  |                  | 0.1                                      |
| Diesel                         | 1  |                  | 0.1                                      |
| Oil                            | 1  |                  | 0.2                                      |
| TSS (mg/l)                     |  |                  | 5  |

1 - Table 3-1 PH JSCS Guidance, 7/16/2007 revision

2 -Draft PH Feasibility Study Section 2.2 Tables. July 2015. RAO 3, 4, and 7 PRGs.

**Table 3**  
**Solids Analytical Laboratory Methods, Sample Containers, Holding Times, and Preservation**

| Analytical Parameter  | Analytical Method | Container      | Minimum Mass<br>Req'd for Analysis | Holding Time                          | Preservation |
|---|-------------------|----------------|------------------------------------|---------------------------------------|--------------|
| Aluminum Antimony, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Silver, Zinc | EPA 6020          | 8-oz glass jar | 5 grams                            | 6 months<br>28 days for Hg            | 4 ±2°C       |
| Tributyltin   | KRONE             | 8-oz glass jar | 30 grams                           | 14 days to extract<br>1 year analysis | 4 ±2°C       |
| PCB Aroclors, Congeners, and Homologs   | EPA 1668          | 8-oz glass jar | 30 grams                           | 14 days to extract<br>1 year analysis | 4 ±2°C       |
| Dioxins/furans  | EPA 8290          | 8-oz glass jar | 30 grams                           | 14 days to extract<br>1 year analysis | 4 ±2°C       |
| PAHs  | EPA 8270SIM       | 8-oz glass jar | 30 grams                           | 14 days to extract<br>1 year analysis | 4 ±2°C       |
| Total Organic Carbon  | PSEP              | 4-oz glass jar | 10 grams                           | 14 days to extract<br>1 year analysis | 4 ±2°C       |
| Total Petroleum Hydrocarbons  | NW-TPH Methods    | 8-oz glass jar | 20 grams                           | 14 days to extract<br>1 year analysis | 4 ±2°C       |

**Table 4**  
**Solids Analytical Laboratory Detection Limits**

| Chemical                    | Portland Harbor SLV<br>JSCS <sup>1</sup> | PRG <sup>2</sup> | Analytical Laboratory<br>Detection Limit Goal |
|-----------------------------|--|------------------|---|
| PAHs (ug/kg)                |  |                  |   |
| 2-Methylnaphthalene         | 200                                      |                  | 3.3   |
| Acenaphthene                | 300                                      |                  | 3.3   |
| Acenaphthylene              | 200                                      |                  | 3.3   |
| Anthracene                  | 845                                      |                  | 3.3   |
| Benzo(a)anthracene          | 1050                                     |                  | 3.3   |
| Benzo(a)pyrene              | 1450                                     |                  | 3.3   |
| Benzo(b)fluoranthene        |  |                  | 3.6   |
| Benzo(g,h,i)perylene        | 300                                      |                  | 3.3   |
| Benzo(k)fluoranthene        | 13000                                    |                  | 3.3   |
| Chrysene                    | 1290                                     |                  | 3.3   |
| Dibenzo(a,h)anthracene      | 1300                                     |                  | 3.3   |
| Fluoranthene                | 2230                                     |                  | 3.3   |
| Fluorene                    | 536                                      |                  | 3.3   |
| Indeno(1,2,3-cd)pyrene      | 100                                      |                  | 3.3   |
| Naphthalene                 | 561                                      |                  | 3.3   |
| Phenanthrene                | 1170                                     |                  | 4.4   |
| Pyrene                      | 1520                                     |                  | 3.3   |
| Detected CPAHs (BaP TEF)    |  | 12               | 4.4   |
| Detected PAHs               |  | 23000            | 4.4   |
| PCBs (ug/kg)                |  |                  |   |
| Aroclor 1016                | 530                                      |                  | 5.0   |
| Aroclor 1221                |  |                  | 5.0   |
| Aroclor 1232                |  |                  | 5.0   |
| Aroclor 1242                |  |                  | 5.0   |
| Aroclor 1248                | 1500                                     |                  | 5.0   |
| Aroclor 1254                | 300                                      |                  | 5.0   |
| Aroclor 1260                | 200                                      |                  | 5.0   |
| Aroclor 1262                |  |                  | 5.0   |
| Aroclor 1268                |  |                  | 5.0   |
| Total Detected PCB aroclors | 0.39                                     | 9                | 5.0   |
| PCB Congeners (pg/g)        |  |                  |   |
| CL1-PCB-1                   |  |                  | 0.05  |
| CL1-PCB-2                   |  |                  | 0.05  |
| CL1-PCB-3                   |  |                  | 0.05  |
| CL2-PCB-4                   |  |                  | 0.05  |
| CL2-PCB-5                   |  |                  | 0.05  |
| CL2-PCB-6                   |  |                  | 0.05  |
| CL2-PCB-7                   |  |                  | 0.05  |
| CL2-PCB-8                   |  |                  | 0.05  |
| CL2-PCB-9                   |  |                  | 0.05  |
| CL2-PCB-10                  |  |                  | 0.05  |
| CL2-PCB-11                  |  |                  | 0.05  |
| CL2-PCB-12/13               |  |                  | 0.05  |
| CL2-PCB-14                  |  |                  | 0.05  |
| CL2-PCB-15                  |  |                  | 0.05  |
| CL3-PCB-16                  |  |                  | 0.05  |
| CL3-PCB-17                  |  |                  | 0.05  |
| CL3-PCB-19                  |  |                  | 0.05  |
| CL3-PCB-21/33               |  |                  | 0.05  |
| CL3-PCB-22                  |  |                  | 0.05  |
| CL3-PCB-23                  |  |                  | 0.05  |
| CL3-PCB-24                  |  |                  | 0.05  |
| CL3-PCB-25                  |  |                  | 0.05  |
| CL3-PCB-26/29               |  |                  | 0.05  |
| CL3-PCB-27                  |  |                  | 0.05  |
| CL3-PCB-28/20               |  |                  | 0.05  |
| CL3-PCB-30/18               |  |                  | 0.05  |
| CL3-PCB-31                  |  |                  | 0.05  |
| CL3-PCB-32                  |  |                  | 0.05  |

**Table 4**  
**Solids Analytical Laboratory Detection Limits**

| Chemical                     | Portland Harbor SLV<br>JSCS <sup>1</sup> | PRG <sup>2</sup> | Analytical Laboratory<br>Detection Limit Goal |
|------------------------------|--|------------------|---|
| CL3-PCB-34                   |  |                  | 0.05  |
| CL3-PCB-35                   |  |                  | 0.05  |
| CL3-PCB-36                   |  |                  | 0.05  |
| CL3-PCB-37                   |  |                  | 0.05  |
| CL3-PCB-38                   |  |                  | 0.05  |
| CL3-PCB-39                   |  |                  | 0.05  |
| CL4-PCB-41/40/71             |  |                  | 0.05  |
| CL4-PCB-42                   |  |                  | 0.05  |
| CL4-PCB-43                   |  |                  | 0.05  |
| CL4-PCB-44/47/65             |  |                  | 0.05  |
| CL4-PCB-45/51                |  |                  | 0.05  |
| CL4-PCB-46                   |  |                  | 0.05  |
| CL4-PCB-48                   |  |                  | 0.05  |
| CL4-PCB-50/53                |  |                  | 0.05  |
| CL4-PCB-52                   |  |                  | 0.05  |
| CL4-PCB-54                   |  |                  | 0.05  |
| CL4-PCB-55                   |  |                  | 0.05  |
| CL4-PCB-56                   |  |                  | 0.05  |
| CL4-PCB-57                   |  |                  | 0.05  |
| CL4-PCB-58                   |  |                  | 0.05  |
| CL4-PCB-59/62/75             |  |                  | 0.05  |
| CL4-PCB-60                   |  |                  | 0.05  |
| CL4-PCB-61/70/74/76          |  |                  | 0.05  |
| CL4-PCB-63                   |  |                  | 0.05  |
| CL4-PCB-64                   |  |                  | 0.05  |
| CL4-PCB-66                   |  |                  | 0.05  |
| CL4-PCB-67                   |  |                  | 0.05  |
| CL4-PCB-68                   |  |                  | 0.05  |
| CL4-PCB-69/49                |  |                  | 0.05  |
| CL4-PCB-72                   |  |                  | 0.05  |
| CL4-PCB-73                   |  |                  | 0.05  |
| CL4-PCB-77                   | 52                                       |                  | 1.0   |
| CL4-PCB-78                   |  |                  | 0.1   |
| CL4-PCB-79                   |  |                  | 0.1   |
| CL4-PCB-80                   |  |                  | 0.1   |
| CL4-PCB-81                   | 17                                       |                  | 1.0   |
| CL5-PCB-82                   |  |                  | 0.1   |
| CL5-PCB-83/99                |  |                  | 0.1   |
| CL5-PCB-84                   |  |                  | 0.1   |
| CL5-PCB-88/91                |  |                  | 0.1   |
| CL5-PCB-89                   |  |                  | 0.1   |
| CL5-PCB-92                   |  |                  | 0.1   |
| CL5-PCB-94                   |  |                  | 0.1   |
| CL5-PCB-95/100/93/102/98     |  |                  | 0.1   |
| CL5-PCB-96                   |  |                  | 0.1   |
| CL5-PCB-103                  |  |                  | 0.1   |
| CL5-PCB-104                  |  |                  | 0.1   |
| CL5-PCB-105                  | 170                                      |                  | 1.0   |
| CL5-PCB-106                  |  |                  |   |
| CL5-PCB-107/124              |  |                  | 0.1   |
| CL5-PCB-108/119/86/97/125/87 |  |                  | 0.1   |
| CL5-PCB-109                  |  |                  | 0.1   |
| CL5-PCB-110/115              |  |                  | 0.1   |
| CL5-PCB-111                  |  |                  | 0.1   |
| CL5-PCB-112                  |  |                  | 0.1   |
| CL5-PCB-113/90/101           |  |                  | 0.1   |
| CL5-PCB-114                  | 170                                      |                  | 1.0   |
| CL5-PCB-117/116/85           |  |                  | 0.1   |
| CL5-PCB-118                  | 120                                      |                  | 1.0   |
| CL5-PCB-120                  |  |                  | 0.1   |
| CL5-PCB-121                  |  |                  | 0.1   |
| CL5-PCB-122                  |  |                  | 0.1   |
| CL5-PCB-123                  | 210                                      |                  | 1.0   |

**Table 4**  
**Solids Analytical Laboratory Detection Limits**

| Chemical                | Portland Harbor SLV<br>JSCS <sup>1</sup> | PRG <sup>2</sup> | Analytical Laboratory<br>Detection Limit Goal |
|-------------------------|--|------------------|---|
| CL5-PCB-126             | 0.05                                     |                  | 1.0   |
| CL5-PCB-127             |  |                  | 0.1   |
| CL6-PCB-128/166         |  |                  | 0.1   |
| CL6-PCB-130             |  |                  | 0.1   |
| CL6-PCB-131             |  |                  | 0.1   |
| CL6-PCB-132             |  |                  | 0.1   |
| CL6-PCB-133             |  |                  | 0.1   |
| CL6-PCB-134/143         |  |                  | 0.1   |
| CL6-PCB-136             |  |                  | 0.1   |
| CL6-PCB-137             |  |                  | 0.1   |
| CL6-PCB-138/163/129/160 |  |                  | 0.1   |
| CL6-PCB-139/140         |  |                  | 0.1   |
| CL6-PCB-141             |  |                  | 0.1   |
| CL6-PCB-142             |  |                  | 0.1   |
| CL6-PCB-144             |  |                  | 0.1   |
| CL6-PCB-145             |  |                  | 0.1   |
| CL6-PCB-146             |  |                  | 0.1   |
| CL6-PCB-147/149         |  |                  | 0.1   |
| CL6-PCB-148             |  |                  | 0.1   |
| CL6-PCB-150             |  |                  | 0.1   |
| CL6-PCB-151/135/154     |  |                  | 0.1   |
| CL6-PCB-152             |  |                  | 0.1   |
| CL6-PCB-153/168         |  |                  | 0.1   |
| CL6-PCB-155             |  |                  | 0.1   |
| CL6-PCB-156/157         | 210                                      |                  | 1.0   |
| CL6-PCB-158             |  |                  | 0.1   |
| CL6-PCB-159             |  |                  | 0.1   |
| CL6-PCB-161             |  |                  | 0.1   |
| CL6-PCB-162             |  |                  | 0.1   |
| CL6-PCB-164             |  |                  | 0.1   |
| CL6-PCB-165             |  |                  | 0.1   |
| CL6-PCB-167             | 210                                      |                  | 1.0   |
| CL6-PCB-169             | 0.21                                     |                  | 2.0   |
| CL7-PCB-170             |  |                  | 0.1   |
| CL7-PCB-171/173         |  |                  | 0.1   |
| CL7-PCB-172             |  |                  | 0.1   |
| CL7-PCB-174             |  |                  | 0.1   |
| CL7-PCB-175             |  |                  | 0.1   |
| CL7-PCB-176             |  |                  | 0.1   |
| CL7-PCB-177             |  |                  | 0.1   |
| CL7-PCB-178             |  |                  | 0.1   |
| CL7-PCB-179             |  |                  | 0.1   |
| CL7-PCB-180/193         |  |                  | 0.1   |
| CL7-PCB-181             |  |                  | 0.1   |
| CL7-PCB-182             |  |                  | 0.1   |
| CL7-PCB-183/185         |  |                  | 0.1   |
| CL7-PCB-184             |  |                  | 0.1   |
| CL7-PCB-186             |  |                  | 0.1   |
| CL7-PCB-187             |  |                  | 0.1   |
| CL7-PCB-188             |  |                  | 0.1   |
| CL7-PCB-189             | 1200                                     |                  | 1.0   |
| CL7-PCB-190             |  |                  | 0.05  |
| CL7-PCB-191             |  |                  | 0.05  |
| CL7-PCB-192             |  |                  | 0.05  |
| CL8-PCB-194             |  |                  | 0.05  |
| CL8-PCB-195             |  |                  | 0.05  |
| CL8-PCB-196             |  |                  | 0.05  |
| CL8-PCB-197/200         |  |                  | 0.05  |
| CL8-PCB-198/199         |  |                  | 0.05  |
| CL8-PCB-201             |  |                  | 0.05  |
| CL8-PCB-202             |  |                  | 0.05  |
| CL8-PCB-203             |  |                  | 0.05  |
| CL8-PCB-204             |  |                  | 0.05  |

**Table 4**  
**Solids Analytical Laboratory Detection Limits**

| Chemical                             | Portland Harbor SLV |                  | Analytical Laboratory<br>Detection Limit Goal |
|--------------------------------------|---------------------|------------------|---|
|                                      | JSCS <sup>1</sup>   | PRG <sup>2</sup> |   |
| CL8-PCB-205                          |                     |                  | 0.05  |
| CL9-PCB-206                          |                     |                  | 0.05  |
| CL9-PCB-207                          |                     |                  | 0.05  |
| CL9-PCB-208                          |                     |                  | 0.05  |
| CL10-PCB-209                         |                     |                  | 0.05  |
| Total PCB congeners                  | 390                 | 9000             | 1 to 4  |
| Dioxins (pg/g)                       |                     |                  |   |
| 1,2,3,4,6,7,8-HeptaCDD               | 690                 |                  | 0.12  |
| 1,2,3,4,6,7,8-HeptaCDF               | 690                 |                  | 0.12  |
| 1,2,3,4,7,8,9-HeptaCDF               | 690                 |                  | 0.13  |
| 1,2,3,4,7,8-HexaCDD                  |                     |                  | 0.081   |
| 1,2,3,4,7,8-HexaCDF                  | 2.7                 | 0.0023           | 0.076   |
| 1,2,3,6,7,8-HexaCDD                  |                     |                  | 0.073   |
| 1,2,3,6,7,8-HexaCDF                  | 2.7                 |                  | 0.073   |
| 1,2,3,7,8,9-HexaCDD                  |                     |                  | 0.11  |
| 1,2,3,7,8,9-HexaCDF                  | 2.7                 |                  | 0.081   |
| 1,2,3,7,8-PentaCDD                   | 2.6                 | 0.13             | 0.15  |
| 1,2,3,7,8-PentaCDF                   | 2.6                 |                  | 0.082   |
| 2,3,4,6,7,8-HexaCDF                  | 2.7                 |                  | 0.087   |
| 2,3,4,7,8-PentaCDF                   | 0.030               | 0.190            | 0.055   |
| 2,3,7,8-TetraCDD                     | 0.0091              | 0.14             | 0.059   |
| 2,3,7,8-TetraCDF                     | 0.77                | 0.41             | 0.091   |
| OCDF                                 | 23000               |                  | 0.20  |
| OCDD                                 | 23000               |                  | 0.16  |
| Butyltins (ug/kg)                    |                     |                  |   |
| Butyltin ion                         |                     |                  | 1.4   |
| Dibutyltin ion                       |                     |                  | 3.9   |
| Tributyltin ion                      | 2.3                 | 24000            | 1.4   |
| Metals (mg/kg)                       |                     |                  |   |
| Aluminum                             |                     |                  | 1.0   |
| Antimony                             | 64                  |                  | 0.60  |
| Arsenic                              | 7                   | 3                | 0.60  |
| Cadmium                              | 1                   | 5                | 0.60  |
| Chromium                             | 111                 |                  | 1.0   |
| Copper                               | 149                 | 149              | 1.00  |
| Lead                                 | 17                  | 128              | 0.60  |
| Manganese                            | 1100                |                  | 0.60  |
| Mercury                              | 0.07                | 1.1              | 0.050   |
| Nickel                               | 48.6                |                  | 1.00  |
| Selenium                             | 2                   |                  | 0.40  |
| Silver                               | 5                   |                  | 0.60  |
| Zinc                                 | 459                 | 459              | 2.0   |
| Total Petroleum Hydrocarbons (mg/kg) |                     |                  |   |
| Gasoline                             |                     |                  | 4.0   |
| Diesel                               |                     |                  | 20  |
| Oil                                  |                     |                  | 40  |

1 - Table 3-1 PH JSCS Guidance, 7/16/2007 revision

2 - Draft PH Feasibility Study Section 2.2 Tables. July 2015. RAO 3, 4, and 7 PRGs.

# **Figures**

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Portland,  
Oregon



Approximate Scale

5000 feet

Base photograph April 2015

**Figure 1**  
Site Location Map  
Burgard Industrial Park

**BRIDGEWATER GROUP, INC.**

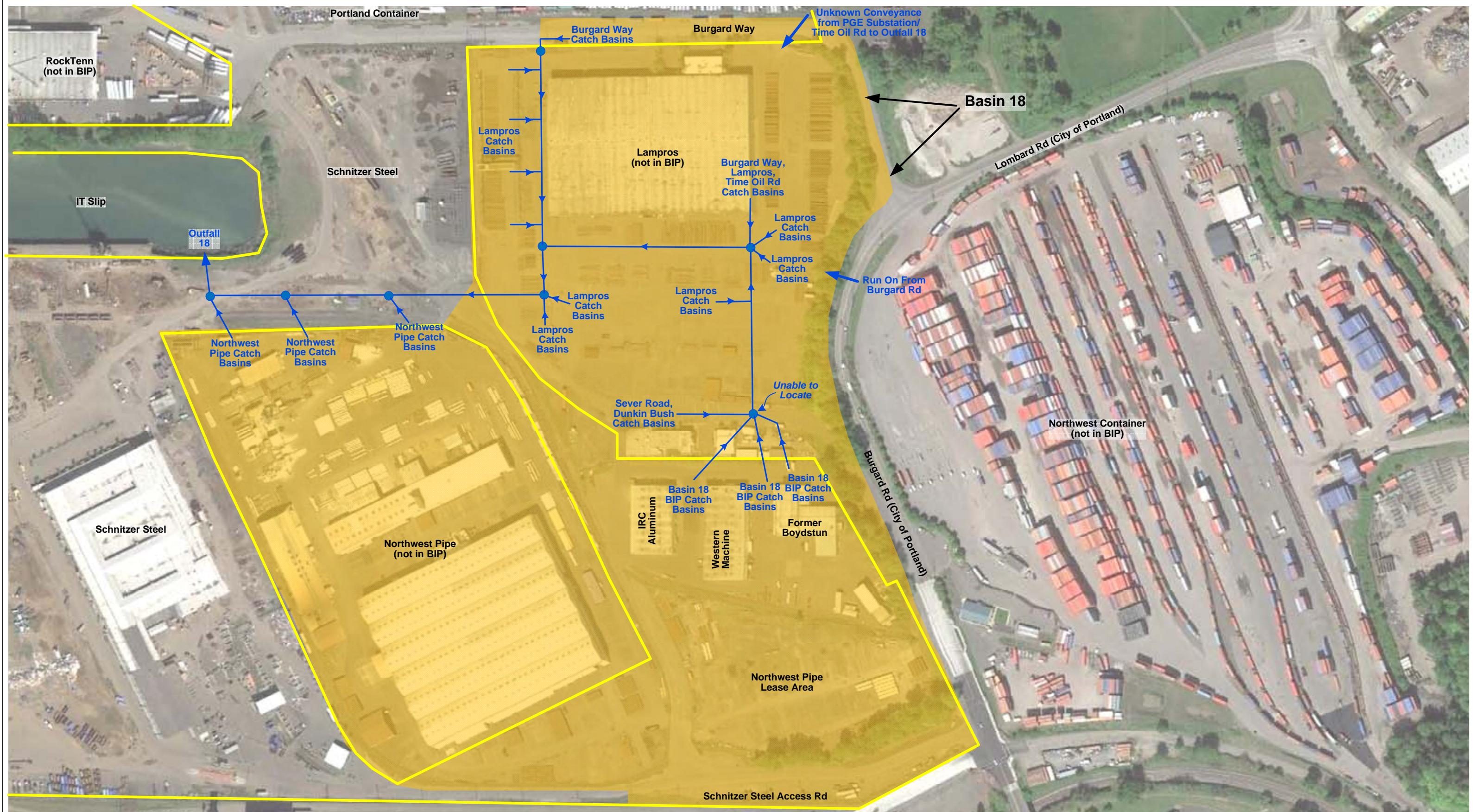


## Approximate Scale

400 Feet

**Figure 2**

Site Plan  
Burgard Industrial Park  
Portland, Oregon



**Figure 3**

**Basin 18 Site Plan**  
**Burgard Industrial Park**  
**Portland, OR**

**BRIDGEWATER GROUP, INC.**